

this sewer has to retain at its lowest end, at a secure level to the district, for a period of six hours in the twelve (during the rise and recession of the tide), the whole of the sewage accumulated in that time.

The usual quantity of water thus held back, in dry weather and under ordinary circumstances, is about 100,000 cubic feet; but during storms and falls of rain, this is evident, must be far short of the actual quantity passing down the sewer, which, to act effectually as a reservoir, ought to be of sufficient capacity to meet every emergency, otherwise upon the concurrence of a heavy storm of rain with a high flood tide, the same liability would arise of submerging the district; but in this latter case, by the water pent back within the sewer.

This consideration has been the chief difficulty attending the question, and has occasioned what may at first view appear to have been an unnecessary enlargement of the sewer at its lower end. When, however, we take into account the extent of surface drained, and estimate the quantity of rain falling upon it during the six hours when the gates are closed at half an inch in depth over the whole surface (which is a moderate computation), and supposing even one-half of this quantity absorbed by the ground, there would still remain nearly two millions (1,815,000) cubic feet of water passing down the sewer, requiring a reservoir of nearly seven acres in extent, and six feet in depth,—we are not surprised to learn that even the present large capacity has been occasionally found insufficient, that more than once the water within the sewer has risen to the height of the external tide, or nearly 14 feet above the sill of the gates. It is evident, therefore, that those few and general principles applicable to the drainage of ordinary districts are, from the peculiar circumstances already alluded to, insufficient for the relief of the one under consideration, and consequently the question of its efficient drainage has at all times been a matter of frequent and earnest consideration with the Westminster Court of Sewers. About the commencement of the present century the attention of the court was seriously and more particularly drawn to the subject, and to the necessity of providing an improved outfall for the general relief of the district. Among the reasons which more particularly concurred to urge this, not the least was the fact that, in consequence of the recent great increase of buildings and paved streets in the district (independent of the proportionate increase of sewage thereby occasioned), any sudden fall of rain, from there being less absorbing and retaining surface, was carried immediately into the main sewer. This was not only found to be altogether insufficient in capacity, but, from its irregularity of levels and extremely tortuous course, had the effect of so far damming back the stream, as to occasion, more than once, considerable damage to the adjoining property. It was, moreover, in parts exceedingly old and dilapidated, and the increasing value of the ground near Pimlico, as well as towards the lower parts of the district about Westminster, called strongly for some more efficient protection.

As the present object is more to describe the improved state of this sewer than its original capacity or condition, I need merely observe that, in consequence of these reasons and representations from the inhabitants, complaining more or less of the inconvenience and inadequacy of the relief afforded by the old line, the court was induced to seek the professional assistance of the late Mr. Rennie, upon whose report, and that of the late surveyor, Mr. Tredgold, much of the subsequent improvements have been effected. These have comprised within the last forty years an entire reconstruction of the old line, from the Thames to St. John's Wood, at a lower level and considerably enlarged capacity, a diversion of its course where it passed under buildings, or was otherwise objectionable, with new outlets, gates, and gate-house, including at the lower end a reservoir for the back-water, these last carried

out under the direction of the eminent engineers Messrs. Walker and Burgess.

It was before observed that the King's Scholars' Pond sewer was originally known as the Aye brook, a small rivulet, which, in common with the Fleet and others of the now scarcely remembered streams of London, and recorded by the old chroniclers as being both the pride and recreation of her citizens, had its source in the hills near Hampstead, and, following the valley of the western district in a direction nearly north and south, discharged itself into the Thames at no great distance from the site of the present outlets.

The King's Scholars' Pond sewer runs very nearly in the original channel of the Aye brook; commencing at Hampstead, it still receives the overflow of the Shepherd's well, and for nearly a mile through the meadows, as far as the Marylebone and Finchley road, is open, and preserves yet much of its primitive and rural character. Thence it begins to be covered, and to the Primrose Hill road is 5 feet in height and 2 feet 6 inches in width; along the latter road to the bridge over the Regent's canal it is enlarged to 6 feet in height by 4 feet in width, receiving in its progress the drainage of Portland Town and St. John's Wood. The surface of the roadway not admitting of the least height, the sewer for a short distance is somewhat reduced, and for the sake of headway is covered with cast-iron plates. From the south side of the canal it continues with a gradually increasing capacity along the Park-road, Upper Baker-street, York-place, Dorset-street, and Manchester-street, where it is 7 feet 3 inches in height by 6 feet 6 inches in width. Proceeding then across the centre of Manchester-square, it passes along Duke-street to Oxford-street, when, turning to the eastward as far as Avery-row, along which continuing in a direction nearly parallel to Bond-street, it cuts the south-east corner of Berkeley-square at the foot of Hay-hill; thence, turning to the westward, it passes under Lansdowne-passage, Bolton-row, Sun-court, White Horse-street, across the Green Park, and through the court in front of Buckingham Palace, where its dimensions are 8 feet in height by 9 feet 6 inches in width. Beneath the south wing of that building, under which the sewer passes, is a vaulted chamber or sub-way, and within it is fixed a simple contrivance, of a cast-iron valve and pentstock, by which the water from the main line may readily be diverted for the purpose of cleansing the flat sewers of Westminster lying between the palace and Millbank.

The line now continues along the Pimlico road as far as Charlotte-street, between which to the Stag Brewery its dimensions have been enlarged to 10 feet 9 inches in height, and 9 feet 6 inches in width; beyond this it passes between the back of the houses in Trevelick-terrace, and the premises of J. Lettison Elliott, Esq., as far as the intersection of the Vauxhall-bridge-road. This last portion is open and is 16 feet wide, and confined on each side by retaining walls 12 inches above the level of the highest known tide of the river. Beyond the Vauxhall-bridge-road, the sewer is open to Warwick-street, but with a greatly increased sectional area for the water-way, the form being an inverted elliptical arched bottom, with a chord line of 19 feet 7 inches, and a versed sine of 3 feet 4 inches, confined by sloping earth embankments, whose superior edge is raised 12 inches above the highest tide level. From Warwick-street to White's-bridge the sewer is again covered, being 19 feet 7 inches wide at the springing, with a headway of 13 feet 4 inches; and for 140 feet beyond this last point the size is again increased, being 20 feet in width and 14 feet 2 inches in height; whence to the gates at the outlet, passing to the eastward of the works of the Equitable Gas Company, the sewer continues open with retaining walls carried above the highest tide level, being, however, for a length of 250 feet from the sluice gates further enlarged to a width of 40 feet, for the purpose of obtaining additional reservoir capacity.

The gates, of which there are two pairs, are of the ordinary lock construction, 28 feet wide, inclosing a chamber built of solid masonry; they incline to the river, and present a superficial aperture towards it of 274 square feet; they are placed under the charge of a gate-keeper residing on the spot, whose duty is to close and open them each tide. The object, I should

observe, of the second pair is merely precautionary, and used only in the event of the first being out of order or under repair.

The whole length of the King's Scholars' Pond sewer, thus described, from its source at Hampstead to the river Thames, is rather more than 5½ miles, of which distance about 4 miles are arched over. The total fall from the Park-road, at the end of Baker-street, to the sill of the gates is 79 feet, giving an average current of about 1 in 220 for the whole distance. Until the last year the arched portions of the King's Scholars' Pond sewer terminated at the part near to Charlotte-street, Pimlico, but upon the application of Mr. Thomas Cubitt, whose property abuts upon the line, to arch over certain portions of the same, the Court of Sewers was induced to concede its permission conditionally upon a public roadway being preserved throughout the entire length so covered. This was guaranteed, and the work was executed according to a section furnished by the commissioners, and under the direction of their officers. It was at the same time decided that Mr. Cubitt having completed the portion undertaken by him, the remaining length of 500 feet down to White's-bridge should be covered over at the expense of the district; the contract for which was subsequently taken by Mr. Cubitt for 1,350*l.* being at the rate of 2*l.* 14*s.* per running foot inclusive of shafts, &c. The section shows a semi-circular arch two bricks in thickness and 19 feet 7 inches span, raised upon the old elliptical arched bottom, with counterforts or buttresses at every 10 feet, 2 feet 3 inches wide by 1 foot 6 inches projection. The whole backed with concrete to the height of the haunches of the arch; the first few courses above the old work are in cement.

The above portion of the sewer presents a superficial area of water-way, amounting to 210 square feet, being nearly one-third greater capacity than the Cloaca Maxima of Rome. At certain intervals there are inserted in the crown of the arch cast-iron gratings, for the purpose of giving vent to the air liable to accumulate with the descending water, which otherwise, if confined, might be apt, upon any sudden rise of the stream, to blow up the arch of the sewer. There are also, at intervals of about every 150 feet, descending shafts for the purpose of occasionally inspecting and repairing the work.

It may readily be supposed that the reconstruction of so important a work from the Thames to St. John's Wood, a distance of nearly 18,000 feet, undertaken in the crowded thoroughfares of a large city, subject to the hourly interruptions of its business and traffic, has not been accomplished without a considerable degree of labour, perseverance, and expense. The total outlay upon this sewer alone, within the last thirty years, I may venture to say, has been little short of 130,000*l.* But the benefits have more than compensated even this vast expenditure. Property of the most valuable description in the neighbourhood of the sewer, including Buckingham Palace, the lower floors of which are below the high tide level, and many of the streets adjacent to the sewer, between Piccadilly and the Regent's-park, have been improved to an incalculable extent. Formerly, many localities in the neighbourhood of the sewer were inundated by every sudden heavy fall of rain, so that many of the houses in Berkeley-square, Bruton-street, Avery-row, South Moulton-street, Wigmore-street, South-street, Baker-street, and Spring-street, were greatly depreciated in value, and some houses in Berkeley-street and Bruton-street remained unoccupied for many months together, in consequence of the well-known fact, that in the summer months those premises were subject to have their lower floors blown up during thunder storms, and their kitchen fires extinguished by the waters descending the sewer. If, however, further proof were required of the extreme value of a good and efficient system of drainage, such as that adopted by the Westminster commission; I need only instance the very important property now rendered available between the Pimlico road and the river Thames; in fact, the district below the high tide level, and formerly subject to its periodical interruption, which, from being heretofore little better than a swamp, perfectly valueless, and most injurious to the health of the neighbourhood, now promises to become one of the most splendid and luxurious quarters of the metropolis.

\* Taking the total number of houses drained by the King's Scholars' Pond sewer at 16,000, the ordinary daily amount of back water would give about 22 cubic feet of sewage for each house in the twenty-four hours, about 147th part of the average supply to each tenement by the River and other water companies. The deficiency may perhaps be taken as an approximate measure of that lost by evaporation and absorption before passing into the public sewers. But in the case above assumed of a fall of rain, the proportion of the quantity absorbed would, no doubt, be considerably higher.